Metoder KI

Assignment 1

Exercise 1

A:

Med 5 kort kan man ha
52 forskjellige kort som første,
51 som andre, osv. Så antall
forskjellige hender blir
$\binom{52}{5} = \frac{52!}{47!5!} = 2\,598\,960$
(rekkefølgen er ubetydelig)

B:

The probability of each atomic event will be 1/number of atomic events, which is 2598960. Which means any atomic event has the probability 1 in 6 million.

C:

The probability of being dealt a royal straight flush is the number of royal straight flush possibilities (4) divided by the total number of possible hands. Which gives a chance of 4 in 2.6 million.

To find the probability of 4 of a kind we have to find out how many hands has a four of a kind. Which means we gotta choose 4 of one card, and then 1 other card, which gives:

(13C1) * (4C4) * (12C1) * (4C1) = 624

The probability of four of a kind is therefore

624 / (52C5) = 1/4165

Exercise 2

A:

To calculate the expected payout of the slot machine, we have to multiply each payout with the probability of receiving that combination:
Each probability is dependent on the permutation.For BAR/BAR/BAR we have 1/4 * 1/4 * 1/4 or 1/64

	Probability	Price	Expected payout
BAR / BAR / BAR	1/64	20	20/64
BELL / BELL / BELL	1/64	15	15/64
LE / LE / LE	1/64	5	5/64
C / C / C	1/64	3	3/64
C / C / !C	3/64	2	6/64
C / !C / !C	9/64	1	9/64
Other		0	0
SUM			29/32

Forventet gevinst hvis du spiller med en krone er cirka 0.9 krone. Så her taper du penger.

B:

Her blir vi spurt om sannsynligheten for å spinne en gang gir gevinst. Da vil jeg legge inn en antagelse om at det å få tilbake den ene kronen man la inn ikke anses som å vinne. For å finne sannsynligheten legger vi bare sammen alle sannsynlighetene for å tjene mer enn en krone fra tabellen. Summen blir da: 7/64, eller cirka 0.1

C:

The code:
I wrote code which simulated the slot machine. I also added variables to decide how many times to play the slots with 10 coins, and how much to bet each time. I also wanted to see what the expected peak profit was, and I was kind of surprised. When I ran 100000 simulations (it required a lot of computation, as I was using the random library). I got the following results:

```
The mean number of rounds was 215.70648.
The mean peak was $30.68648.
The max peak was $1008.
```

The mean number of rounds seemed to stay around the 230-210 range. The mean peak also stayed in the 30 coins range, which was quite surprising to me, I didn't think you could expect to peak at 30 coins on any given round. I also added the max peak statistics for fun.

Exercise 3

Part 1 A:

```
import random

def birthdaySimulator(numOfPeople):
    birthdays = []
    for i in range(numOfPeople):
        birthdays.append(random.randint(1, 365))

    # Check if there are any duplicate birthdays
    if len(birthdays) != len(set(birthdays)):
        return True
    else:
        return False


def main():
    #Variables
    N = 50
    simulations = 100000

    #Simulate
    numOfDuplicates = 0
    for i in range(simulations):
        if birthdaySimulator(N):
            duplicates += 1
    print("\nThe probability in a group of " + str(N) + " is " + str(duplicates / simulations) + ".\n")

if __name__ == "__main__":
    main()
```

Part 1 B:

```
The probability in a group of 23 is 0.5096.
```

The probability exceeds 50 when the group consists of 23 or more people. Which is quite hard to grasp if I am being honest.

Part 2 A:

```
The expected N is 626.9907.
```

When I ran 10 000 simulations, the average number of people needed to fill all days as birthdays was the number above, cirka 627.